

IN THE CLAIMS

Please amend the claims as follows:

1 (Currently Amended): A method of embedding data in material, the method comprising the steps of:

producing transform coefficients $[[Ci]] \underline{C}_i$ representing a transform of the material,
and

combining the coefficients $[[Ci]] \underline{C}_i$ with data symbols $[[Ri]] \underline{R}_i$ to produce modified coefficients $[[Ci']]\underline{C}_i'$ where

$$C_i' = C_i + \alpha_i R_i \quad \underline{C}_i' = \underline{C}_i + \alpha_i \underline{R}_i$$

the method further comprising determining an adaptation strength α_i $[[\alpha_i]]$ for each unmodified coefficient $[[Ci]] \underline{C}_i$ as a function $F\{C_n\}_i$ $F\{C_n\}_i$ of a predetermined set $\{C_n\}_i$ $\{C_n\}_i$ of transform coefficients $[[Cn]] \underline{C}_n$ which set excludes the coefficient $[[Ci]] \underline{C}_i$ wherein the coefficients are serially ordered and the coefficients $[[Cn]] \underline{C}_n$ are coefficients preceding coefficient $[[Ci]] \underline{C}_i$.

2 (Currently Amended): $[[A]]$ The method according to claim 1, wherein the coefficients the set $\{C_n\}_i$ $\{C_n\}_i$ vary with i.

3 (Currently Amended): $[[A]]$ The method according to claim 1, wherein the number $[[Ni]] \underline{N}_i$ of coefficients in the set $\{C_n\}_i$ $\{C_n\}_i$ varies with i.

4 (Currently Amended): $[[A]]$ The method according to claim 1, wherein the coefficients of the set $\{C_n\}_i$ $\{C_n\}_i$ have a predetermined positional relationship with the coefficient $[[Ci]] \underline{C}_i$ to be modified.

5 (Currently Amended): [[A]] The method according to claim 1, wherein the coefficients represent a spatial frequency transform of the material.

6 (Currently Amended): [[A]] The method according to claim 1, wherein the coefficients represent a wavelet transform of the material.

7 (Currently Amended): [[A]] The method according to claim 6, wherein the transform produces coefficients [[Ci]] C_i in a plurality of bands.

8 (Currently Amended): [[A]] The method according to claim 7, wherein the transform coefficients forming the set {C_n}_i {C_n}_i are all in the same band.

9 (Currently Amended): [[A]] The method according to claim 7, wherein the transform coefficients forming the set {C_n}_i {C_n}_i are in a plurality of bands.

10 (Currently Amended). [[A]] The method according to claim 1, wherein the said function F{C_n}_i F{C_n}_i is such that

$$\alpha_i = \frac{1}{N_i} \sqrt{\sum C_n^2} \text{ for } n = i-1 \text{ to } i-N_i \text{ for } N_i \neq 0 \text{ and } \alpha_i = k \text{ for } N_i = 0$$

$$\alpha_i = \frac{1}{N_i} \sqrt{\sum C_n^2} \text{ for } n = i-1 \text{ to } i-N_i \text{ for } N_i \neq 0 \text{ and } \alpha_i = k \text{ for } N_i = 0,$$

where [[Ni]] N_i is the number of coefficients [[Cn]] C_n in set i.

11 (Currently Amended): ~~[[A]]~~ The method according to claim 1, wherein the said data symbols ~~[[Ri]]~~ R_i are of a pseudo random symbol sequence having symbols ~~[[Pi]]~~ P_i modulated by data ~~[[Wj]]~~ W_j to be embedded.

12 (Currently Amended): ~~Apparatus~~ An apparatus for embedding data in material, comprising

a transformer for producing transform coefficients ~~[[Ci]]~~ C_i representing a transform of the material, and

a combiner for combining the coefficients ~~[[Ci]]~~ C_i with data symbols ~~[[Ri]]~~ R_i to produce modified coefficients ~~[[Ci']]~~ C_i' where

$$C_i' = C_i + \alpha_i R_i \quad C_i' = C_i + \alpha_i R_i,$$

the apparatus further comprising

a calculator for calculating an adaptation strength ~~[[α_i]]~~ α_i for each unmodified coefficient ~~[[Ci]]~~ C_i as a function ~~$F\{C_n\} + F\{C_n\}_i$~~ of a predetermined set ~~$\{C_n\} + \{C_n\}_i$~~ of transform coefficients ~~[[Cn]]~~ C_n which set excludes the coefficient ~~[[Ci]]~~ C_i , wherein the coefficients are serially ordered and the coefficients ~~[[Cn]]~~ C_n are coefficients preceding coefficient ~~[[Ci]]~~ C_i .

13 (Currently Amended): The apparatus ~~Apparatus~~ according to claim 12, wherein the coefficients of the set ~~$\{C_n\} + \{C_n\}_i$~~ vary with i .

14 (Currently Amended): The apparatus ~~Apparatus~~ according to claim 12, wherein the unmodified coefficients of the set ~~$\{C_n\} + \{C_n\}_i$~~ have a predetermined positional relationship with the coefficient ~~[[Ci]]~~ C_i to be modified.

15 (Currently Amended): The apparatus ~~Apparatus~~ according to claim 12, wherein the coefficients represent a spatial frequency transform of the material.

16 (Currently Amended): The apparatus ~~Apparatus~~ according to claim 12, wherein the coefficients represent a wavelet transform of the material

17 (Currently Amended): The apparatus ~~Apparatus~~ according to claim 16, wherein the transformer produces coefficients $[[C_i]]$ C_i in a plurality of frequency bands.

18 (Currently Amended): The apparatus ~~Apparatus~~ according to claim 17, wherein the transform coefficients forming the set $\{C_n\}_i$ $\{C_n\}_i$ are all in the same band.

19 (Currently Amended): The apparatus ~~Apparatus~~ according to claim 18, wherein the transform coefficients forming the set $\{C_n\}_i$ $\{C_n\}_i$ are in a plurality of bands.

20 (Currently Amended): The apparatus ~~Apparatus~~ according to claim 12, wherein the said function $F\{C_n\}_i$ $F\{C_n\}_i$ is such that

$$\alpha_i = \frac{1}{N_i} \cdot \sqrt{\sum C_n^2} \text{ for } n = i-1 \text{ to } i-N_i \text{ for } N_i \neq 0 \text{ and } \alpha_i = k \text{ for } N_i = 0$$

$$\alpha_i = \frac{1}{N_i} \cdot \sqrt{\sum C_n^2} \text{ for } n = i-1 \text{ to } i-N_i \text{ for } N_i \neq 0 \text{ and } \alpha_i = k \text{ for } N_i = 0,$$

where $[[N_i]]$ N_i is the number of coefficients $[[C_n]]$ C_n in set i.

21 (Currently Amended): $[[A]]$ The method according to claim 1, wherein the data is imperceptibly embedded in the other material.

22 (Currently Amended):[[A]] The method according to claim 1, wherein the set $\{C_n\}_i, \{C_n\}_i$ ~~consists of~~ includes unmodified coefficients.

23 (Currently Amended): The [[A]] method ~~or apparatus~~ according to claim 1, wherein the set $\{C_n\}_i, \{C_n\}_i$ consists of modified coefficients preceding [[Ci]] C_i where the coefficients are serially ordered.

24 (Currently Amended): [[A]] The method ~~or apparatus~~ according to claim 1, wherein the set $\{C_n\}_i, \{C_n\}_i$ comprises at least one modified coefficient and at least one unmodified coefficient.

25 (Currently Amended): A method of removing data embedded in material ~~according to the method of claim 1~~, the detecting method further comprising:

determining the values of the data symbols [[Ri]] R_i ;

calculating, for each modified coefficient [[Ci']] C_i' , the value of the said function $F\{C_n\}_i, F\{C_n\}_i$ of the corresponding set $\{C_n\}_i, \{C_n\}_i$ of coefficients [[Cn]] C_n to determine [[α_i]] α_i ; and

for each modified coefficient [[Ci']] C_i' , subtracting therefrom ~~$\alpha_i R_i - \alpha_i R_i$~~ to restore the unmodified coefficient value [[Ci]] C_i , wherein the coefficients are serially ordered and the said set $\{C_n\}_i, \{C_n\}_i$ consists of modified coefficients preceding coefficient [[Ci]] C_i .

26 (Currently Amended): [[A]] The method according to claim 25, wherein the said set $\{C_n\}_i, \{C_n\}_i$ ~~consists of~~ includes restored coefficients [[Ci]] C_i ~~and comprising the the~~

method further comprising a step of using a restored coefficient $[[C_i]] \underline{C}_i$ as a coefficient of another set $\{C_n\}_i, \{C_n\}_i$ of coefficients for restoring another coefficient $[[C_j]] \underline{C}_j$.

27 (Currently Amended): The $[[A]]$ method according to claim 25, wherein the said set $\{C_n\}_i, \{C_n\}_i$ comprises at least one modified coefficient and at least one restored coefficient, the coefficients preceding $[[C_i']] \underline{C}_i$.

28 (Currently Amended): $[[A]]$ The method according to claim 25, further comprising the step of determining the values of the data bits $[[W_j]] \underline{W}_j$ embedded in material by correlating a reference pseudo random symbol sequence with the modified coefficients $[[C_i']] \underline{C}_i'$ and decoding the correlation values to determine the data $[[W_j]] \underline{W}_j$ modulating the pseudo random sequence and remodulating the reference sequence with the said data to restore $[[R_i]] \underline{R}_i$.

29 (Currently Amended): An apparatus ~~Apparatus~~ for removing data embedded in material ~~according to the method of claim 1~~, the apparatus comprising:

a processor for determining the values of the symbols $[[R_i]] \underline{R}_i$;

a calculator for calculating, for each modified coefficient $[[C_i']] \underline{C}_i'$, the value of the said function $F\{C_n\}_i, F\{C_n\}_i$ of the corresponding set $\{C_n\}_i, \{C_n\}_i$ of coefficients $[[C_n]] \underline{C}_n$ to determine $[[\alpha_i]] \underline{\alpha}_i$; and

a subtractor which, for each modified coefficient $[[C_i']] \underline{C}_i'$, subtracts therefrom ~~$\alpha_i \cdot R_i$~~ $\underline{\alpha}_i \cdot \underline{R}_i$ to restore the unmodified coefficient value $[[C_i]] \underline{C}_i$, which thereby becomes available for use as an unmodified coefficient of another set $\{C_n\}_i, \{C_n\}_i$ of unmodified coefficients $[[C_n]] \underline{C}_n$ for restoring another coefficient $[[C_i']] \underline{C}_i'$, wherein the coefficients are serially ordered and the said set $\{C_n\}_i, \{C_n\}_i$ consists of coefficients preceding coefficient $[[C_i]] \underline{C}_i$.

30 (Currently Amended): ~~The apparatus~~ Apparatus according to claim 29, wherein the said set $\{C_n\}_i, \{C_n\}_i$ consists of restored coefficients $[[C_i]] \underline{C}_i$ and further comprising the ~~further step of means for~~ using a restored coefficient $[[C_i]] \underline{C}_i$ as a coefficient of another set $\{C_n\}_{i+1}, \{C_n\}_{i+1}$ of coefficients for restoring another coefficient $C_{i+1} \underline{C}_{i+1}$.

31 (Currently Amended): ~~The apparatus~~ Apparatus according to claim 30, wherein the said set $\{C_n\}_i, \{C_n\}_i$ ~~consists of~~ includes modified coefficients preceding coefficient $[[C_i]] \underline{C}_i$.

32 (Currently Amended): ~~The apparatus~~ Apparatus according to claim 30, wherein the said set $\{C_n\}_i, \{C_n\}_i$ comprises at least one modified coefficient and at least one restored coefficient, the coefficients preceding $[[C_i']] \underline{C}'_i$.

33 (Currently Amended): ~~The apparatus~~ Apparatus according to claim 29, further ~~comprising~~ comprising means for determining the values of the data bits $[[W_j]] \underline{W}_i$ embedded in the material, said means for determining comprising a correlator for correlating a reference pseudo random symbol sequence with the modified coefficients $[[C_i']] \underline{C}'_i$, a decoder for decoding the correlations to determine the data $[[W_j]] \underline{W}_i$ modulating the modulated sequence and a modulator for remodulating the reference sequence with the said data to restore $[[R_i]] \underline{R}_i$.

34 (Previously Presented): A computer program product arranged to carry out the method of claim 1 when run on a computer.

35 (Currently Amended): A computer program product arranged to carry out the method of claim 25 when run on a computer.

36 (Currently Amended): The ~~[[A]] method or apparatus~~ according to claim 1, wherein the material is video material.

37 (Currently Amended): The ~~[[A]] method or apparatus~~ according to claim 1, wherein the material is audio material.

38 (Currently Amended): The ~~[[A]] method or apparatus~~ according to claim 1, wherein the material is audio/visual material.

39-58 (Cancelled).

59 (Currently Amended): The Apparatus apparatus according to claim 12, wherein the data is imperceptibly embedded in the other material.

60 (Currently Amended): The Apparatus apparatus according to claim 12, wherein the set ~~$\{C_n\}$~~ $\{C_n\}$ consists of unmodified coefficients.

61 (Currently Amended): The Apparatus apparatus according to claim 12, wherein the set ~~$\{C_n\}$~~ $\{C_n\}$ ~~consists of~~ includes unmodified coefficients.

62 (Currently Amended): ~~The Apparatus~~ apparatus according to claim 12, wherein the set $\{C_n\}_{i=1}^n$ comprises at least one modified coefficient and at least one unmodified coefficient.